Winter Severity Indices for 2001-2002 and 2002-2003

By Tim Van Deelen

Abstract

This report details the Winter Severity Index (WSI) monitoring for northern Wisconsin during the winters of 2001-2002 and 2002-2003. Region-wide, both winters were very mild relative to a 30-year average. Average WSI was 29.1 in 2001-2002 and 46.6 in 2002-2003. Consequently, winter weather impacts to the 2002 and 2003 fawn cohorts are expected to be minor.

Background (Wisconsin Department of Natural Resources 2001)

Prior to 1975, Wisconsin did not have a formal procedure for measuring winter severity and predicting its impact on deer herds. Michigan was using a severity index that used calorimeters to estimate a winter air-chill factor, and snow depth and sinking-depth measurements to estimate a snow-hazard factor (Verme 1968). The air-chill and snow-hazard factors were added together at the end of each week to derive a cumulative severity index. Ontario was using the Passmore-Hepburn Method, which also entails rather complex snow measurements (Passmore and Hepburn 1955).

Our winter severity index (WSI) was developed after testing several procedures for quantifying winter conditions (Kohn 1975). It used the number of days with a minimum temperature of 0^{o}F or below as a measure of winter air-chill, and the number of days with 18 or more inches of snow on the ground to estimate the snow hazard. These are added together from 1 December through 30 April to obtain the WSI. Days with both a minimum temperature of below 0^{o}F, and with 18 inches or more of snow on the ground add 2 points to the WSI. U.S. Department of Commerce (USDC) weather data were initially used to measure winter severity because they were easily obtained, and initially allowed us to compare WSI for previous winters with historical deer data (results of dead deer surveys, Summer Deer Observations, and buck harvests). The WSI was calculated for each USDC station and then averaged to obtain the Northern Forest WSI.

Beginning in the winter of 1986-87, weather data were collected at 35 DNR stations across the North (Fig. 1*).* Daily snow depths and minimum temperatures were recorded at these stations from 1 December through 30 April on a standardized form, and this information was sent to the Northern Wildlife Research Group at the end of each month. Survey instructions request that the presence of crusts be recorded. To date, information on crusts has not been incorporated into the index, but this information may affect our interpretation of the index.

WSI values for the Northern Forest from 1959-60 through 1999-2000 are shown in fig. 2. Winters are considered “mild” if the calculated WSI is less than 50, “moderate” if it is between 50 and 80, “moderately severe” if it is between 80 and 100, and “very severe” if the WSI exceeds 100. The 30-year average is 67. These designations are based on observed associations between WSI and winter mortality, fawn production, and buck harvest during the following year (Wisconsin Department of Natural Resources 2001).

Results

2001-2002: The winter of 2001-2002 was very mild relative to the 30-year average. The average WSI across 34 stations reporting was 29.1 (SE = 19.036, Table 1). Roughly 57% of the accumulated WSI points were "temperature" points although across northern Wisconsin snow depth was more variable than temperature (Table 1). December, January, and February were especially mild. Most WSI points were accumulated during March (Figure 2). Not surprisingly, variation among snow depth and temperature was also highest during March (Table 1, Fig. 3).

Among individual stations, only 3 reported WSIs reflective of moderately severe conditions (Brule, Highbridge, and Iron River). One station was borderline severe (WSI=80, Upson, Table 1).

2002-2003: The winter of 2002-2003 was also very mild relative to the 30-year average. The average across 34 stations reporting was 46.6 (SE = 8.5). This winter was essentially snow-less in terms of winter severity. Roughly 98% of the accumulated WSI points were "temperature" points (Table 2) and most of these were accumulated during cold weather events in January and February (Fig. 4). Only one station (Upson) reported significant increases in WSI due to snow in February and March (Table 2).

Among individual stations, 11 reported WSIs reflective of moderately severe conditions (50<WIS<80, Table 2) and 0 reported severe conditions (WSI>80).

Discussion

Region-wide the winters of 2001-2002 and 2002-2003 were not severe enough to cause concern for excessive winter mortality or depressed fawn production during the springs of 2002 and 2003. Consequently we expect relatively robust year-classes for deer born during 2002 and 2003. However, solid reproduction region-wide does not preclude local deer populations from experiencing winter weather effects where winter conditions are relatively severe (e.g. Upson area). A cluster of deer management units in northwestern Wisconsin reported a reduced proportion of yearling deer of both sexes in the 2003 harvest (Wisconsin Department of Natural Resources 2003). This cluster associates with a region where WSIs are characteristically higher (Bayfield, Ashland, and Iron counties) thus reduced yearling recruitment could reflect a winter weather effect. This issue warrants continued monitoring.

Acknowledgments

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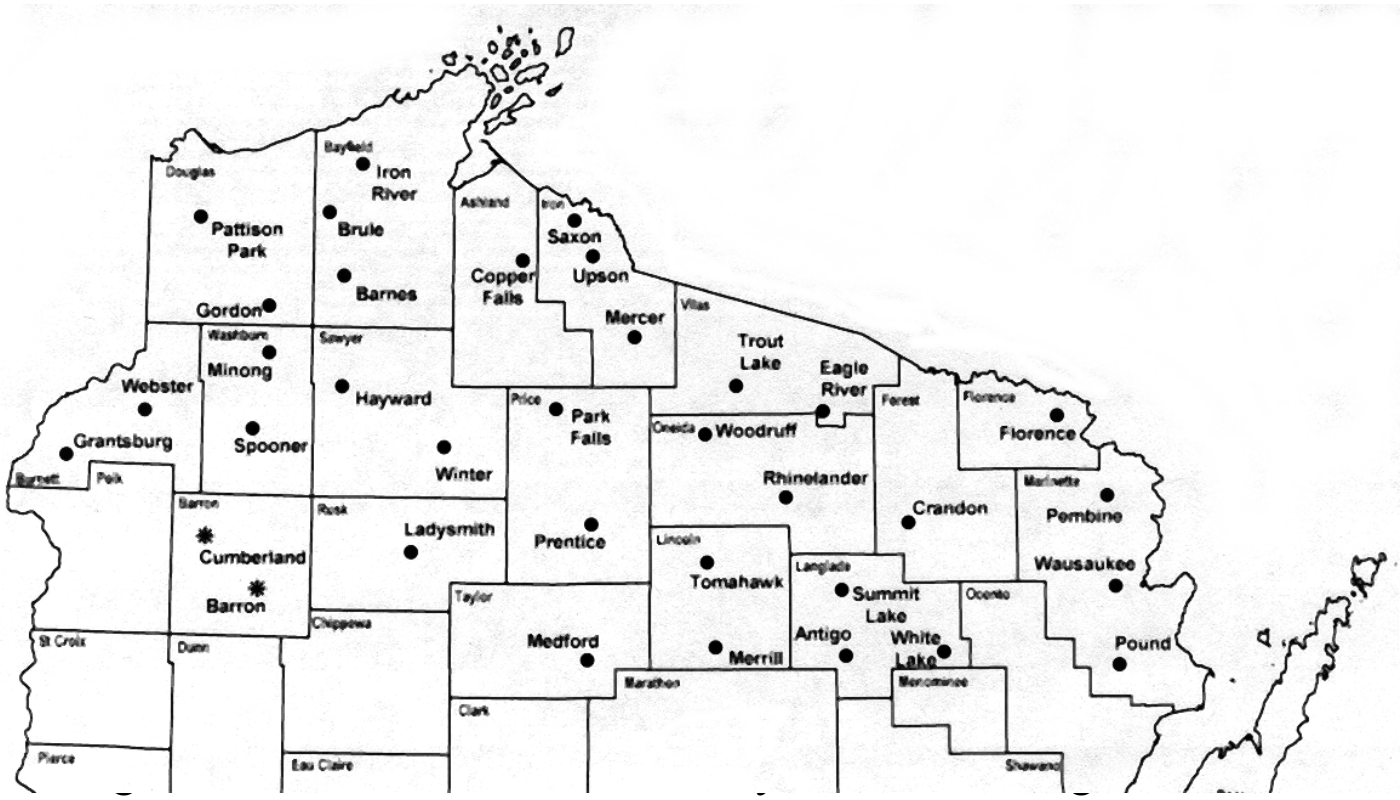

Figure 1. *Location of winter severity index recording stations, 1990-00 (* indicate supplemental stations).*

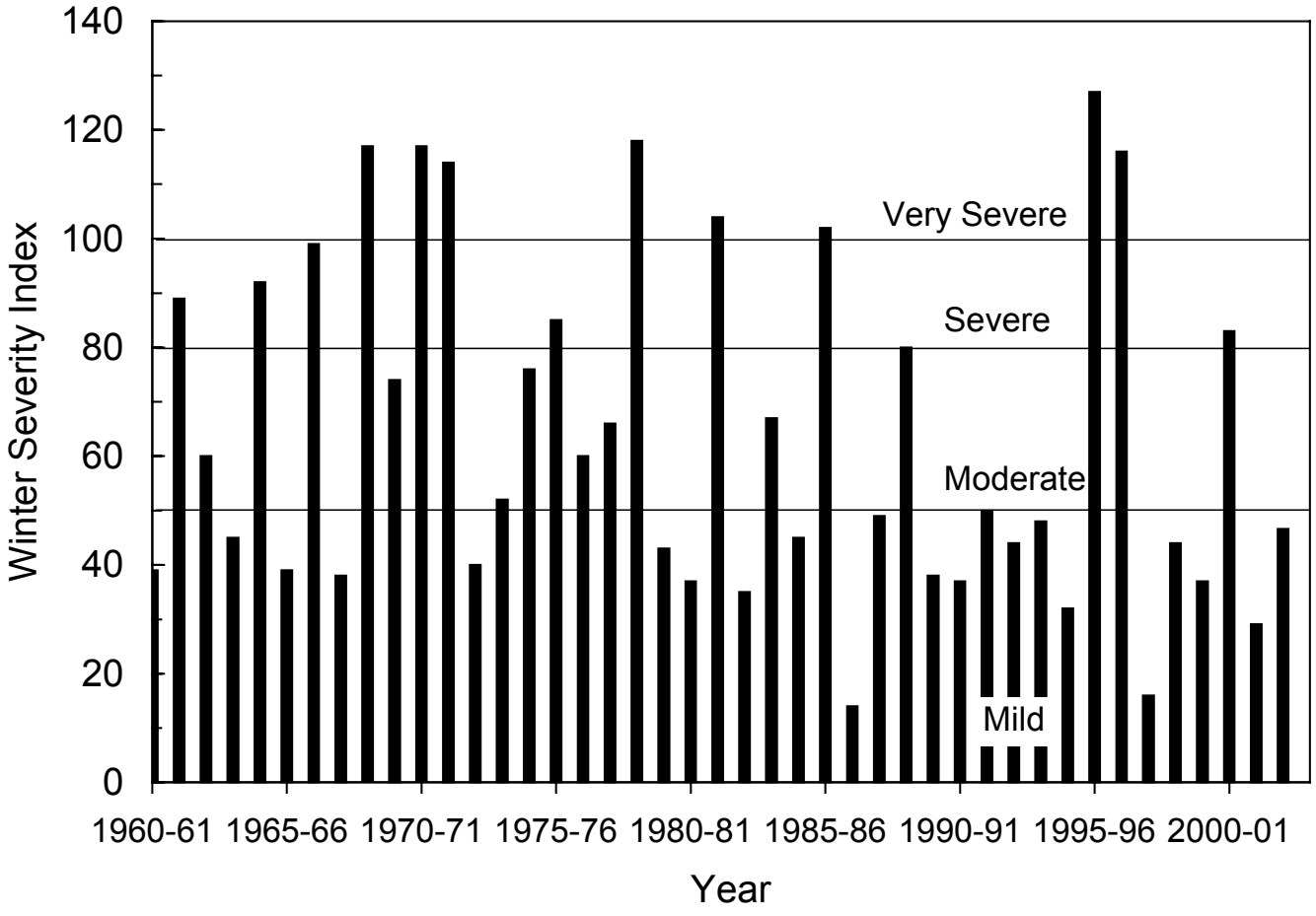

Figure 2. *Winter Severity Indices 1960-1961 to 2000-2001.*

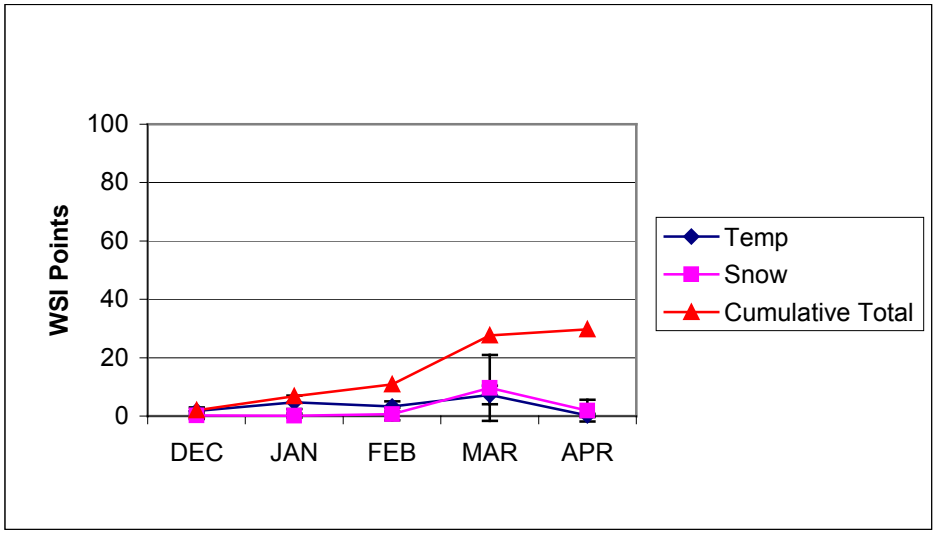

Figure 3. *WSI trend during 2001-2002. Error bars represent ± 1 standard error.*

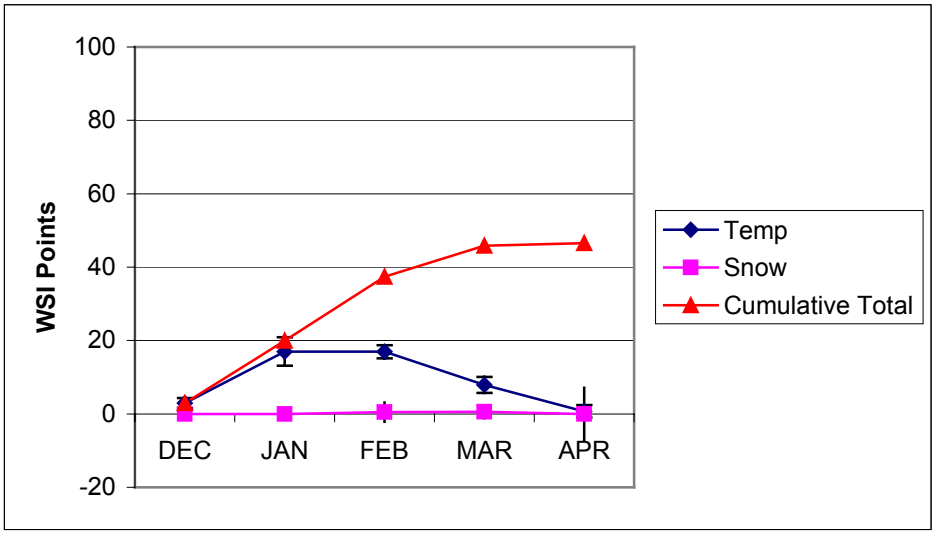

Figure 4. *WSI trend during 2002-2003. Error bars represent ± 1 standard error.*

Table 1. *WSI data reported for 2001-2002. TEMP = number of days with temperatures < 0° F, SNOW = number of days with snow depths > 18 inches.*

	DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		TOTAL		
STATION	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TOTAL
Antigo	2	0	3	0	1	0	2	0	0	0	8	0	8
Barron	3	0	8	0	3	0	4	0	0	0	18	0	18
Brule	2	1	7	0	4	2	10	23	0	2	23	28	51
Copper Falls S.P.					4	0	8	31	0	6	12	37	49
Crandon	2	0	4	0	3	0	4	0	0	0	13	0	13
Eagle River	3	0	5	0	4	0	11	17	0	9	23	26	49
Gordon	2	0	9	0	5	0	9	4	0	0	25	4	29
Grantsburg	2	0	6	0	4	0	6	0	0	0	18	0	18
Hayward	2	0	5	0	5	0	9	2	0	0	21	2	23
Highbridge (Kero Kampers 4-H)	0	0	3	0	1	6	9	31	0	0	13	37	50
Iron River	1	0	5	0	5	4	9	31	0	9	20	44	64
Florence East	1	0	1	0	1	0	9	0	0	0	12	0	12
Ladysmith	1	0	2	0	2	0	2	0	0	0	7	0	7
Mercer	2	0	6	0	4	0	11	26	2	10	25	36	61
Merrill	3	0	3	0	4	0	7	0	0	0	17	0	17
Minong	4	0	7	0	6	0	11	13	0	0	28	13	41
New Wood	1	0	2	0	2	0	3	0	1	0	9	0	9
Park Falls	2	0	6	0	5	0	13	15	0	0	26	15	41
Pattison	2	0	2	0	4	0	5	14	0	0	13	14	27
Pembine	0	0	3	0	1	0	4	0	0	0	8	0	8
Prentice	4	0	7	0	5	0	8	0	0	0	24	0	24
Rhinelander	0	0	2	0	0	0	5	2	0	0	7	2	9
Saxon							7	22			7	22	29
Spooner	2	0	6	0	4	0	8	3	0	0	20	3	23
Summit Lake	2	0	3	0	2	0	2	0	0	0	9	0	9
Trout Lake	0	0	4	0	2	0	8	21	0	10	14	31	45
Tomahawk	4	0	10	0	8	0	11	0	2	0	35	0	35
Upson	0	7	4	4	2	10	9	31	1	12	16	64	80
Wausaukee	0	0	2	0	1	0	2	0	0	0	5	0	5
Webster	2	0	5	0	3	0	8	4	0	0	18	4	22
White Lake	2	0	3	0	2	0	2	0	0	0	9	0	9
Willow Lake	2	0	4	0	2	0	9	12	0	0	17	12	29
Winter	3	0	7	0	5	0	11	12	0	0	26	12	38
Woodruff	0	0	7	0	4	1	9	14	1	3	21	18	39
Averages	1.8	0.3	4.7	0.1	3.3	0.7	7.2	9.6	0.2	1.8	16.7	12.5	29.1
SE	1.2	1.2	2.3	0.7	1.8	2.1	3.2	11.3	0.5	3.7	7.4	16.5	19.0

Table 2. *WSI data reported for 2002-2003. TEMP = number of days with temperatures < 0° F, SNOW = number of days with snow depths > 18 inches.*

	DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		TOTAL		
STATION	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TEMP	SNOW	TOTAL
Antigo	3	0	26	0	17	0	7	0	1	0	54	0	54
Barron	0	0	20	0	20	0	19	0	10	0	69	0	69
Barnes	6	0	17	0	18	0	8	0	0	0	49	0	49
Brule	5	0	17	0	18	0	7	0	0	0	47	0	47
Copper Falls S.P.	5	0	20	0	17	0	9	0	0	0	51	0	51
Crandon	3	0	15	0	19	0	9	0	0	0	46	0	46
Eagle River	4	0	19	0	18	0	9	0	1	0	51	0	51
Gordon	4	0	20	0	19	0	8	0	0	0	51	0	51
Grantsburg	2	0	18	0	17	0	8	0	0	0	45	0	45
Hayward	2	0	17	0	17	0	7	0	0	0	43	0	43
Iron River	5	0	20	0	17	0	9	0	0	0	51	0	51
Florence East	4	0	13	0	15	0	7	0	2	0	41	0	41
Ladysmith	0	0	13	0	16	0	8	0	0	0	37	0	37
Mercer	4	0	17	0	17	0	8	0	1	0	47	0	47
Merrill	3	0	15	0	18	0	7	0	1	0	44	0	44
Minong	3	0	16	0	19	0	8	0	0	0	46	0	46
New Wood	3	0	14	0	14	0	6	0	0	0	37	0	37
Park Falls	3	0	16	0	19	0	9	0	0	0	47	0	47
Pattison	4	0	16	0	19	0	8	0	0	0	47	0	47
Pembine	4	0	15	0	15	0	7	1	1	0	42	1	43
Prentice	2	0	17	0	16	0	7	0	0	0	42	0	42
Rhinelander	1	0	17	0	16	0	6	0	1	0	41	0	41
Saxon	3	0	10	0	15	0	8	3	0	0	36	3	39
Spooner	1	0	14	0	15	0	7	0	0	0	37	0	37
Summit Lake	3	0	26	0	17	0	7	0	1	0	54	0	54
Trout Lake	2	0	19	0	16	0	8	0	1	0	46	0	46
Tomahawk	5	0	21	0	19	0	7	0	1	0	53	0	53
Upson	3	0	16	0	16	16	8	15	0	0	43	31	74
Wausaukee	3	0	7	0	16	0	9	0	0	0	35	0	35
Webster	1	0	14	0	11	0	4	0	0	0	30	0	30
White Lake	2	0	24	0	17	0	7	0	1	0	51	0	51
Willow Lake	3	0	14	0	17	0	7	0	1	0	42	0	42
Winter	2	0	19	0	19	0	9	0	0	0	49	0	49
Woodruff	3	0	17	0	17	0	7	0	1	0	45	0	45
Averages	3.0	0	17.0	0	16.9	0.5	7.9	0.6	0.7	0	45.6	1.0	46.6
SE	1.4	0	3.9	0	1.8	2.7	2.2	2.6	1.7	0	7.1	5.3	8.5